Appendix K

Fish Data
Sites C-11 through C-15 Summer 2006

E and E Group, L.L.C.
Environmental Consultants

FINDINGS FOR THE SALTWATER FISH SAMPLING
SITES C-11, C-12, C-13, C-14 and C-15
TERREBONNE BASIN PROJECT

SEPTEMBER 2006

P.O. BOX 11186
JEFFERSON, LOUISIANA 70181-1186
(504) 464-9906 PHONE
(504) 464-9816 FAX

FINDINGS FOR THE SALTWATER FISH SAMPLING SITES C-11, C-12, C-13, C-14 and C-15 TERREBONNE BASIN PROJECT

SEPTEMBER 2006

E & E GROUP, LLC
P.O. BOX 11186
JEFFERSON, LOUISIANA 70181-1186

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Findings for the Saltwater Fish Sampling
Sites C-11, C-12, C-13, C-14 and C-15
Terrebonne Basin Project

Introduction

The purpose of this project is to collect physical, chemical, and biological data to establish a basis for the refinement of existing aquatic life use categories and applicable water quality criteria for freshwater and estuarine waterbodies in the Terrebonne Basin of Louisiana. This work is being performed for U.S. EPA Region 6.

The focus of these analyses will be to describe the association between the observed biological communities and the dissolved oxygen regime within each habitat type, accounting for other factors that influence biota such as flow, temperature, sediment characteristics, etc. The objective of the project is to explore potential approaches to establishing alternative DO criteria that correspond to "tiers" of aquatic life use designations. Louisiana water quality standards currently include a use designation for fish and wildlife propagation that includes a subcategory of "limited aquatic life and wildlife use." However, the DO criteria are not specific to these use designations.

This portion of the project involved the collection of fish at five high salinity locations in the Terrebonne Basin. The locations spanned from Bayou Jean La Croix near Point-aux- Chenes to a small bayou off Lake Mechant approximately 9 miles south of Theriot. Fish specimens were collected using an otter trawl and gill nets. The locations were sampled over the period of August 7 to 9, 2006. A map of the project area showing the sampling stations is included as **Figure 1, Sheets 1 through 4**.

Methods

The topography of the project area was obtained from available USGS 7.5' Louisiana quadrangles. The area for C-11 is shown on the Lake Tambour NE quadrangle, the area for C-12 is shown on the Lake Felicity NE quadrangle and the area for C-13 is shown on the Dog Lake NE and Bayou Sauveur SE quadrangles. The area for both C-14 and C-15 are shown on the Lake Mechant SE quadrangle. All maps and station coordinates were referenced to NAD83 (Latitude, Longitude).

All sampling was carried out on an outboard powered 19 ft workboat drawing approximately 1.5 ft of water. Locations for the survey were determined using a Trimble NT300D 12 channel global positioning system (GPS) receivers. Data from the USCG differential GPS (DGPS) broadcast transmitter at English Turn, Louisiana (29° 52.7 degrees North Latitude, 89° 56.6 degrees West Longitude) were used to provide real time

differential correction (Type 9) of the GPS data. The differentially corrected position data accuracy is typically 1.0 meter or better for the NT300D DGPS.

Trawl samples were collected with a 16 ft otter trawl comparable to trawls used by the Louisiana Department of Wildlife & Fisheries, Marine Fisheries Division. The samples consisted of three-10 minute trawls. The contents of the net were placed in a washtub and the individuals identified, counted, examined for disease and released. Small individuals were handled the same as the larger individuals unless closer examination of the specimen is necessary for identification. Those individuals were preserved for identification, counting and measuring, if necessary. The sportfish collected at each sampling site were measured and released.

In addition to the trawl samples, two 50 ft gill nets with 1.5 inch stretch mesh were placed at locations in the bayou. The individuals collected by this method were handled in the same manner as the trawl samples.

Specimens were identified to genus and species in most cases. Lengths of the sportfish were taken and recorded. Due to the large number of anchovies collected in the trawls at location C-12, the number of specimens was approximated by weighing a known number of anchovies. The remainder of the anchovies in the sample was weighed and the number of specimens determined.

At site C-11, trawl number three was only pulled for eight minutes due to extremely shallow water at the east end of the bayou sampled. At sites C-14 and C-15 only one gill net was deployed due to damage to the second gill net rendering it non-functional.

In order to maintain quality control of the fish identifications, the field data sheets listing the identification, number and lengths (if required) were signed by the field personnel. Those specimens that were brought back and identified in the laboratory were discussed with knowledgeable fish personnel. These fish were then added to the Site data sheet, which was signed by the appropriate personnel.

Findings

Sample locations were selected from a list of sites generated by the Louisiana Department of Environmental Quality (LDEQ). Reference sites were selected primarily based upon land uses, discharge locations, and local expertise. In order to obtain least-impacted sites, water bodies located in areas surrounded by agricultural, industrial, or urban land uses, or impacted by point source discharges, were not considered suitable. Accessibility was also a key consideration. None of the sites appeared to have been recently dredged.

A brief description of each site is as follows: Site C-11, Bayou Tambour - this site, LDEQ site 3089, was accessed from the Pointe-Aux-Chenes Launch, Store, and Inn. This was a saline site in an intermediate-sized canal. During the site reconnaissance the plants observed at this site included *Spartina* sp. and *Juncus* sp; while the animals included grass shrimp (*Palaemonetes* sp.), marsh periwinkle (*Littoraria irrorata*), *Adinia xenica* (killifish), *Uca* sp. (fiddler crabs), and *Sesarma* sp. (crabs). The land use in this area was non-forested wetland. A map showing the trawl route(s) and the gill net locations is given in **Figure 2**.

Site C-12, Jude's Cut off Bayou Jean La Croix – this site was accessed from the Pointe-aux-Chenes Launch, Store, and Inn. This site was classified as saline/intermediate canal and was in a non-forested wetland area. During the site reconnaissance the observed flora included *Spartina* sp. And *Juncus* sp., while observed fauna included marsh periwinkle (*Littoraria irrorata*), grass shrimp (*Palaemonetes* sp.), *Sesarma* (crabs), mysids (*Mysidaceae*), *Geukensia* shell (ribbed mussel), *Adinia xenica* (killifish) and mullet (*Mugil* sp.). A map showing the trawl route(s) and the gill net locations is given in **Figure 3**.

Site C-13, Bayou Platt and Four Island Bayou – this site was accessed from the launch in Dulac at T-Irv's. The site was classified as saline/intermediate canal. During the site reconnaissance the observed biota included two species of Spartina, *Juncus* sp., *Mytilopsis leucophaeta* (bivalve mollusk), and *Adinia xenica* (killifish). The land use in the area was non-forested wetland. A map showing the trawl route(s) and the gill net locations is given in **Figure 4**.

Site C-14, Fred Bayou - this site was off of Bayou Dularge, into Mud Lake, and into Fred Bayou. It was accessed from the public boat launch at the end of Highway 315. During the site reconnaissance the observed biota at the site included *Menidia*, mullet, *Neritina reclivata* (snail), mysids, *Palaemonetes* (grass shrimp), *Rhithropanopeus harissii* (crab), *Gammarus* (amphipod), Odonata (dragonflies), *Rangia* (clam) shell (dead), and *Crassostrea* (oyster) shell (dead). This site was classified as saline / intermediate canal. Land use in the area is non-forested wetland. A map showing the trawl route(s) and the gill net locations is given in **Figure 5**.

Site C-15, Off of Bayou Dularge - this site was near LDEQ site 3087 and was accessed from the public boat launch at the end of Highway 315. It was classified as saline/large canal. Land use in the area was non-forested wetland. During the site reconnaissance the organisms observed at the site included *Penaeus* (shrimp), various crabs (*Rhithropanopeus harissii, Callinectes sapidus, Uca*), *Corophium* (amphipod), and gastropods. A map showing the trawl route(s) and the gill net locations is given in **Figure 6**.

For the three days of sampling at the five sites a total 15 trawl samples and eight gill net samples were collected. Approximately 3,386 specimens representing twenty seven species of finfish were collected. All of the specimens were primarily marine or estuarine species. **Table 1** contains a list of the finfish collected at the five sites during August 7 to 9, 2006.

The trawl sampling collected 3,334 specimens and 23 species of finfish, while the gill net samples collected 52 specimens and eight species of finfish. The gill nets collected the larger size fish and more of the sportfish. **Tables 2** and **3** show the finfish collected in the trawl and gill net sampling, respectively.

Bay anchovy represented the largest percentage of the specimens by number caught at 86 percent. Other common species included Atlantic croaker (4.7%), pinfish (1.6%), gafftopsail catfish (1.5%) and spadefish (1.4%). Sportfish were not common in the trawl samples due in part to the type of sample equipment used and in part to the areas trawled not being ideal sportfishing habitat.

Site C-12 and C-13 had similar numbers of species and specimens; with Site C-12 having with 20 species and 1,133 specimens, respectively and C-13 having with 1,162 specimens and 16 species of fish. Conversely, Site C-15 showed the fewest number of specimens with 104. Two species of fish were collected at each of the sites, bay anchovy and Atlantic croaker, while eight species were collected at only one sample site.

The trawl collected many more specimens and species of fish than the gill nets. With the small mesh size of the cod end, small juveniles were also able to be collected providing some indication of successful spawning of seatrout, croaker and silver perch in the Terrebonne Basin. The gill nets were able to capture the larger fish and sportfish; however, the most common fish caught by the gill net were the hardhead catfish and the gafftopsail catfish. The trawl samples collected 3,334 individuals and 23 species, while the gill nets collected 52 individuals and eight species. The fish sampling data sheets are provided in **Appendix A**.

Water quality data was collected at each sample site. Temperature (^{o}C), specific conductance (mS/cm), salinity (ppt), dissolved oxygen (mg/l), pH and Secchi disc depth (in) were collected at the mid-depth of the waterway prior to collecting the fish samples. The highest salinity reading was recorded at C-12 at 23.9 ppt, while the lowest salinity reading was found at C-14 at 10.0 ppt. The dissolved oxygen levels ranged from 4.74 to 7.05 mg/l. The water quality data is included as **Table 4**. The field survey form and field data sheets are included in **Appendix B**.

Discussion

It appears that the salinity and the dissolved oxygen (DO) did not have a significant impact on the number of species or individuals found at each sample site. The highest salinity recorded during the project was for C-12, which also had the highest number of species. However, the second highest salinity level was recorded at C-11, which showed the lowest number of species. The lower salinity levels showed both large and small numbers of individuals with between 11 and 16 species of finfish. No correlation could be made regarding salinity and the number and species of finfish present.

The lowest DO level was found at C-12 which had a large number of individuals and the highest number of species. However, at Site C-15, which also had a low DO level, showed a small number of individuals. The highest DO level was found at Site C-11 which showed very few individuals and the lowest number of species. Again no correlation could be made regarding DO and the number and species of finfish present.

A number of juvenile specimens from the Family Sciaenidae were found in the trawl samples collected at Sites C-13, C-14 and C-15. The specimens were mostly seatrout (*Cynoscion* sp.) with some small croaker (*Micropogonias undulatus*) and silver perch (*Bairdiella* chyrsoura) included. These species in this family of fish generally spawn in the early and late summers in the inland bays and bayous along the Gulf coast. Most of the juveniles were found in the lower saline waters of the study area, although the larger speckled trout (*Cynoscion nebulosus*) were collected in the higher saline waters of Sites C-11 and C-12.

The bay anchovy (*Anchoa* mitchilli) generally spawns during the summer months in the lower saline habitats of inshore waters of the Gulf coast. Many of the bay anchovy collected in the trawl samples were post larval and juvenile forms. In addition, large numbers of the bay anchovy were present in both the low and high saline waters of the Terrebonne Basin.

Six specimens of the bull shark (*Carcharrhinus* leucas) were collected in the gill nets at Site C-13 and C-14. This species is generally found in the lower saline waters of the Gulf coast. It is believed that the specimens caught were attempting to feed on the fish already snarled in the gill net and became ensnarled themselves. Another interesting observation was that the sharks were collected in pairs, indicating, although the sex of the sharks collected was not recorded, that these might have been mating pairs.

Summary

The purpose of this project is to collect physical, chemical, and biological data to establish a basis for the refinement of existing aquatic life use categories and applicable water quality criteria for freshwater and estuarine waterbodies in the Terrebonne Basin of Louisiana.

Sample locations were selected from a list of sites generated by the Louisiana Department of Environmental Quality (LDEQ). Reference sites were selected primarily based upon land uses, discharge locations, and local expertise. In order to obtain least-impacted sites, water bodies located in areas surrounded by agricultural, industrial, or urban land uses, or impacted by point source discharges, were not considered suitable.

The trawl sampling collected 3,334 specimens and 23 species of finfish, while the gill net samples collected 52 specimens and eight species of finfish. The gill nets collected the larger size fish including most of the sportfish.

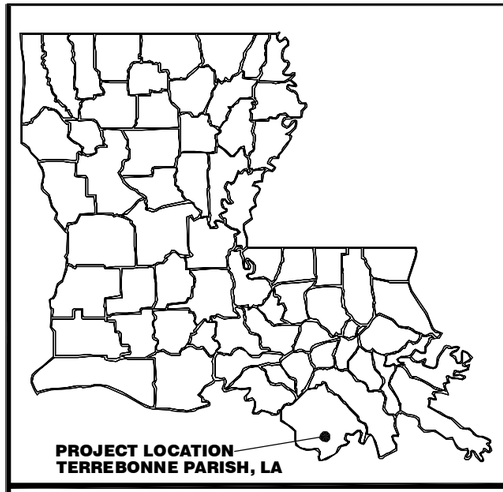
The trawl collected many more specimens and species of fish than the gill nets. The trawl samples collected 3,334 individuals and 23 species, while the gill nets collected 52 individuals and eight species.

Based on this limited sampling project it appears that the salinity and the dissolved oxygen did not have a significant impact on the number of species or individuals found at each sample site. Although the high salinity level at C-12 showed with the highest number of species, the second highest salinity level at C-11 showed the lowest number of species. The lower salinity levels showed both large and small numbers of individuals with between 11 and 16 species of finfish. No correlation could be made regarding salinity and the number and species of finfish present.

The lowest DO level was found at C-12 which had a large number of individuals and the highest number of species. However, at Site C-15 which also had a low DO level showed a small number of individuals. The highest DO level was found at Site C-11 which showed very few individuals and the lowest number of species. No correlation could be made regarding DO and the number and species of finfish present.

Qualifications of the individuals involved in the sampling effort are included in **Appendix C**.

FIGURES



PROJECT LOCATION

BAY BAPTISTE

BAYOU TAMBOUR

C-11
29 21 36.94
90 31 33.03

BAYOU BARRE

LAKE TAMBOUR

800 0 800 1600 FEET

FIGURE 1
SHEET 1 OF 4

SAMPLING LOCATION
C-11
TERREBONNE PARISH, LA
FOR
ARCADIS G&M, INC.

E and E GROUP, L.L.C.
ENVIRONMENTAL CONSULTANTS
P.O. BOX 1186 JEFFERSON, LOUISIANA 70181-1186

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PROJECT LOCATION

BAYOU JEAN LA CROIX

LAKE FELICITY

C-12
29 19 28.21
90 23 37.40

800 0 800 1600 FEET

FIGURE 1
SHEET 2 OF 4

SAMPLING LOCATION
C-12
TERREBONNE PARISH, LA
FOR
ARCADIS G&M, INC.

E and E GROUP, L.L.C.
ENVIRONMENTAL CONSULTANTS
P.O. BOX 1186 JEFFERSON, LOUISIANA 70181-1186

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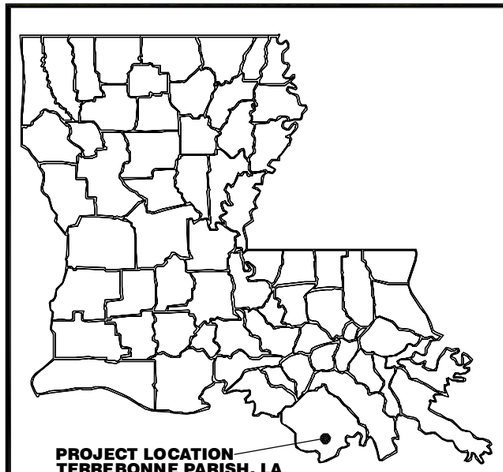

PROJECT LOCATION

BAYOU GRAND CAILLOU

BAYOU GRAND CAILLOU

BAY JULIEN

C-13
29 14 46.93
90 46 38.87

800 0 800 1600 FEET

N

FIGURE 1
SHEET 3 OF 4

SAMPLING LOCATION
C-13
TERREBONNE PARISH, LA
FOR
ARCADIS G&M, INC.

E and E GROUP, L.L.C.
ENVIRONMENTAL CONSULTANTS
P.O. BOX 11186 JEFFERSON, LOUISIANA 70181-186

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PROJECT LOCATION

LAKE MECHANT

C-14
29 18 32.04
90 54 34.98

MUD LAKE

BAYOU DU LARGE

C-15
29 16 57.12
90 52 54.36

1000 500 0 1000 2000 FEET

FIGURE 1
SHEET 4 OF 4

SAMPLING LOCATIONS
C-14 & C-15
TERREBONNE PARISH, LA
FOR
ARCADIS G&M, INC.

E and E GROUP, L.L.C.
ENVIRONMENTAL CONSULTANTS
P.O. BOX 1186 JEFFERSON, LOUISIANA 70181-1186

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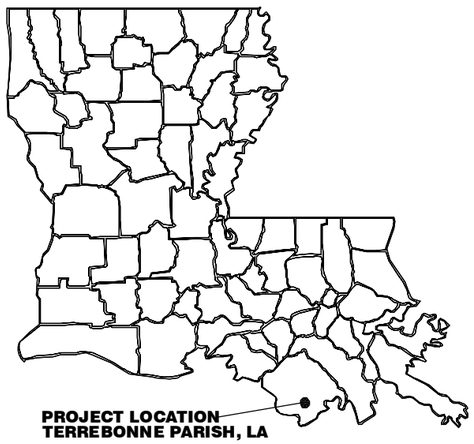

PROJECT LOCATION

BAYOU TAMBOUR

TAMBOUR BAY

LEGEND:

- TRAWL LOCATION

- GILL NET LOCATION

150 75 0 150 300 FEET

FIGURE 2

STATION C-11
TRAWL AND GILL NET
SAMPLING LOCATIONS
TERREBONNE PARISH, LA
FOR
ARCADIS G&M, INC.

E and E GROUP, L.L.C.
ENVIRONMENTAL CONSULTANTS
P.O. BOX 1186 JEFFERSON, LOUISIANA 70181-1186

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PROJECT LOCATION

FIGURE 3

STATION C-12
TRAWL AND GILL NET
SAMPLING LOCATIONS
TERREBONNE PARISH, LA
FOR
ARCADIS G&M, INC.

E and E GROUP, L.L.C.
ENVIRONMENTAL CONSULTANTS
P.O. BOX 1186 JEFFERSON, LOUISIANA 70181-1186

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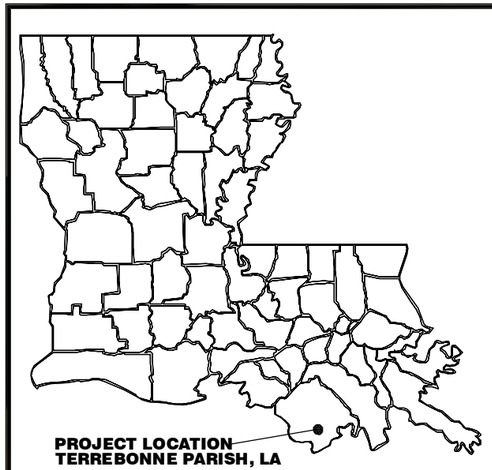

PROJECT LOCATION

BAYOU PLATT

FOUR ISLAND BAYOU

LEGEND:

- TRAWL LOCATION

- GILL NET LOCATION

150 75 0 150 300 FEET

FIGURE 4

STATION C-13
TRAWL AND GILL NET
SAMPLING LOCATIONS
TERREBONNE PARISH, LA
FOR
ARCADIS G&M, INC.

E and E GROUP, L.L.C.
ENVIRONMENTAL CONSULTANTS
P.O. BOX 1186 JEFFERSON, LOUISIANA 70181-1186

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PROJECT LOCATION

LEGEND:

- TRAWL LOCATION
- GILL NET LOCATION

FRED BAYOU

LAKE MECHANT

MUD LAKE

200 0 200 400 FEET

FIGURE 5

STATION C-14
TRAWL AND GILL NET
SAMPLING LOCATIONS
TERREBONNE PARISH, LA
FOR
ARCADIS G&M, INC.

E and E GROUP, L.L.C.
ENVIRONMENTAL CONSULTANTS
P.O. BOX 1186 JEFFERSON, LOUISIANA 70181-1186

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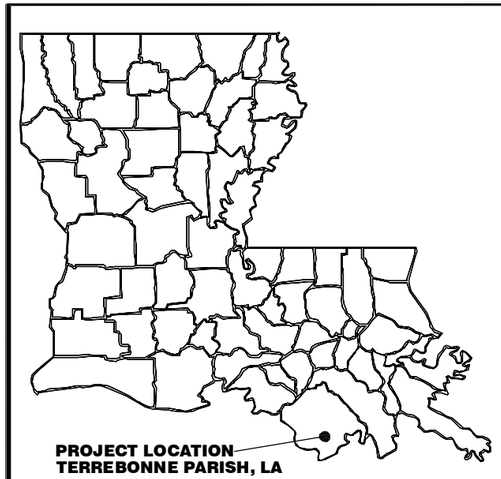

PROJECT LOCATION

BAYOU DU LARGE

LEGEND:

- TRAWL LOCATION

- GILL NET LOCATION

200 0 200 400 FEET

FIGURE 6

STATION C-15
TRAWL AND GILL NET
SAMPLING LOCATIONS
TERREBONNE PARISH, LA
FOR
ARCADIS G&M, INC.

E and E GROUP, L.L.C.
ENVIRONMENTAL CONSULTANTS
P.O. BOX 1186 JEFFERSON, LOUISIANA 70181-1186

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TABLES

TABLE 1

Species and Number of Organisms Collected
Terrebonne Basin

Organism	Common Name	Number of Individuals C-11	Number of Individuals C-12	Number of Individuals C-13	Number of Individuals C-14	Number of Individuals C-15	Total Number of Individuals
Carcharhinus leucas	Bull Shark			**4**	**2**		**6**
Dasyatis americana	Southern Stingray		**3**		**1**		**4**
Elops sarus	Ladyfish		**2**				**2**
Brevoortia patronus	Gulf Menhaden		**1**				**1**
Anchoa mitchilli	Bay Anchovy	**28**	**1,022**	**1,063**	**758**	**54**	**2,925**
Arius felis	Hardhead Catfish	**1**	**16**	**8**		**14**	**39**
Bagre marinus	Gafftopsail Catfish	**2**	**27**	**3**	**16**	**5**	**53**
Opsanus beta	Gulf Toadfish	**1**	**3**	**1**		**2**	**7**
Syngnathus louisianae	Chain Pipefish		**1**				**1**
Selene vomer	Look Down		**1**				**1**
Archosargus probatocephalus	Sheepshead		**1**	**2**		**2**	**5**
Lagodon rhomboides	Pinfish	**7**	**12**	**34**		**4**	**57**
Bairdiella chrysoura	Silver Perch			**3**	**1**		**4**
Cynoscion arenarius	Sand Seatrout			**1**	**6**		**7**
Cynoscion nebulosus	Speckled Trout	**1**	**1**	**1**		**1**	**4**
Cynoscion sp.	Unknown Seatrout			**16**	**2**		**18**
Leiostomus xanthurus	Spot		**2**	**7**		**2**	**11**
Micropogonias undulatus	Atlantic Croaker	**93**	**19**	**9**	**25**	**12**	**158**
Pogonius cromis	Black Drum				**1**		**1**
Sciaenops ocellatus	Red Drum				**1**		**1**
Chaetodipterus faber	Spadefish	**26**	**10**	**6**		**6**	**48**
Chasmodes bosquianus	Striped Blenny			**1**			**1**
Gobioides broussoneti	Violet Goby		**1**	**1**	**1**		**3**
Scomberomorus maculatus	Spanish Mackerel			**1**			**1**
Citharichthys spilopterus	Bay Whiff		**4**				**4**
Paralichthys lethostigma	Southern Flounder		**1**				**1**
Symphurus plagiusa	Blackcheek Tonguefish		**2**				**2**
Sphoeroides parvus	Least Pufferfish	**3**	**4**		**11**	**2**	**20**
TOTALS		**162**	**1,133**	**1,161**	**825**	**104**	**3,385**

TABLE 2

Species and Number of Organisms Collected by Trawling
Terrebonne Basin

Organism	Common Name	Number of Individuals C-11				Number of Individuals C-12				Number of Individuals C-13				Number of Individuals C-14				Number of Individuals C-15				Total Number of Individuals
		Trawl 1	Trawl 2	Trawl 3	Total	Trawl 1	Trawl 2	Trawl 3	Total	Trawl 1	Trawl 2	Trawl 3	Total	Trawl 1	Trawl 2	Trawl 3	Total	Trawl 1	Trawl 2	Trawl 3	Total	
Carcharhinus leucas	Bull Shark																					
Dasyatis americana	Southern Stingray					3			**3**							1	**1**					**4**
Elops sarus	Ladyfish					2			**2**													**2**
Brevoortia patronus	Gulf Menhaden																					
Anchoa mitchilli	Bay Anchovy			28	**28**	345	470	207	**1,022**	376	411	276	**1,063**	255	329	174	**758**		48	6	**54**	**2,925**
Arius felis	Hardhead Catfish						5	2	**7**													**7**
Bagre marinus	Gafftopsail Catfish		2		**2**	1	11	9	**21**			2	**2**	7	3	6	**16**			5	**5**	**46**
Opsanus beta	Gulf Toadfish		1		**1**			3	**3**	1										2	**2**	**6**
Syngnathus louisianae	Chain Pipefish						1		**1**													**1**
Selene vomer	Look Down					1			**1**													**1**
Archosargus probatocephalus	Sheepshead							1	**1**			2	**2**					1		1	**2**	**5**
Lagodon rhomboides	Pinfish	2	2	3	**7**	5	5	2	**12**	12	14	8	**34**					3		1	**4**	**57**
Bairdiella chrysoura	Silver Perch										2	1	**3**			1	**1**					**4**
Cynoscion arenarius	Sand Seatrout											1	**1**	2	1	3	**6**					**7**
Cynoscion nebulosus	Speckled Trout					1			**1**			1	**1**						1		**1**	**3**
Cynoscion sp.	Unknown Seatrout										9	7	**16**		2		**2**					**18**
Leiostomus xanthurus	Spot							2	**2**	1	1	5	**7**					1	1		**2**	**11**
Micropogonias undulatus	Atlantic Croaker	41	48	4	**93**	10	7	2	**19**	3	3	3	**9**	11	6	8	**25**	1	10	1	**12**	**158**
Pogonius cromis	Black Drum																					
Sciaenops ocellatus	Red Drum																					
Chaetodipterus faber	Spadefish	8	18		**26**	1	4	3	**8**	1	2	3	**6**						4	2	**6**	**46**
Chasmodes bosquianus	Striped Blenny									1			**1**									**1**
Gobioides broussoneti	Violet Goby							1	**1**	1			**1**			1	**1**					**3**
Scomberomorus maculatus	Spanish Mackerel											1	**1**									**1**
Citharichthys spilopterus	Bay Whiff					2	2		**4**													**4**
Paralichthys lethostigma	Southern Flounder							1	**1**													**1**
Symphurus plagiusa	Blackcheek Tonguefish					1	1		**2**													**2**
Sphoeroides parvus	Least Pufferfish	1		2	**3**		3	1	**4**					6	3	2	**11**		2		**2**	**20**
TOTALS		52	71	37	**160**	372	509	234	**1,115**	396	442	310	**1,147**	281	344	196	**821**	6	66	18	**90**	**3,333**

TABLE 3

Species and Number of Organisms Collected Using Gill Nets
Terrebonne Basin

Organism	Common Name	Number of Individuals C-11			Number of Individuals C-12			Number of Individuals C-13			No. of Individuals C-14		No. of Individuals C-15		Total Number of Individuals
		GN 1	GN 2	Total	GN 1	GN 2	Total	GN 1	GN 2	Total	GN 1	Total	GN 1	Total	
Carcharhinus leucas	Bull Shark							2	2	**4**	2	**2**			**6**
Dasyatis americana	Southern Stingray														
Elops sarus	Ladyfish														
Brevoortia patronus	Gulf Menhaden				1		**1**								**1**
Anchoa mitchilli	Bay Anchovy														
Arius felis	Hardhead Catfish		1	**1**	5	4	**9**	5	3	**8**			14	**14**	**32**
Bagre marinus	Gafftopsail Catfish					6	**6**	1		**1**					**7**
Opsanus beta	Gulf Toadfish														
Syngnathus louisianae	Chain Pipefish														
Selene vomer	Look Down														
Archosargus probatocephalus	Sheepshead														
Lagodon rhomboides	Pinfish														
Bairdiella chrysoura	Silver Perch														
Cynoscion arenarius	Sand Seatrout														
Cynoscion nebulosus	Speckled Trout		1	**1**			**1**								**2**
Cynoscion sp.	Unknown Seatrout														
Leiostomus xanthurus	Spot														
Micropogonias undulatus	Atlantic Croaker														
Pogonius cromis	Black Drum										1	**1**			**1**
Sciaenops ocellatus	Red Drum										1	**1**			**1**
Chaetodipterus faber	Spadefish				2		**2**								**2**
Chasmodes bosquianus	Striped Blenny														
Gobioides broussoneti	Violet Goby														
Scomberomorus maculatus	Spanish Mackerel														
Citharichthys spilopterus	Bay Whiff														
Paralichthys lethostigma	Southern Flounder														
Symphurus plagiusa	Blackcheek Tonguefish														
Sphoeroides parvus	Least Pufferfish														
TOTALS		0	2	**2**	8	10	**19**	8	5	**13**	4	**4**	14	**14**	**52**

TABLE 4

Water Quality Data
Terrebonne Basin

Parameter	Station C-11	Station C-12	Station C-13	Station C-14	Station C-15
Date	7-Aug-06	7-Aug-06	9-Aug-06	8-Aug-06	8-Aug-06
Temperature °C	31.3	30.1	31.0	32.4	30.0
Specific Conductance mS/cm	35.67	41.50	24.69	19.58	30.63
Salinity ppt	20.1	23.9	13.2	10.0	17.1
Dissolved Oxygen mg/l	7.05	4.74	5.27	6.77	4.90
pH	8.10	7.93	8.01	7.97	7.90
Secchi Disc Depth in	12	12	14	16	16

APPENDIX A

Fish Sampling Field Data Sheets

FISH SAMPLING FIELD DATA SHEET (FRONT)

STREAM NAME Bayou Tambour	LOCATION C-11
STATION # _____ RIVERMILE _____	STREAM CLASS
LAT 29°41'36.9" LONG 90°31'33.0	RIVER BASIN Terrebonne
STORET #	AGENCY
GEAR 16' Otter Trawl 2 Gill Nets	INVESTIGATORS FET RCA SR LF
FORM COMPLETED BY FET	DATE 7 Aug 06 TIME 1550 AM (PM) / REASON FOR SURVEY

SAMPLE COLLECTION	How were the fish captured? ☐ back pack ☐ tote barge ☒ other Gill Net Trawl Block nets used? ☐ YES ☒ NO Sampling Duration Start time 1554 / 1635 End time 1604 / 1645 Duration 10 min @ Stream width (in meters) Max 1707 Mean 1717
HABITAT TYPES	Indicate the percentage of each habitat type present ☐ Riffles ____% ☐ Pools ____% ☐ Runs ____% ☐ Snags ____% ☐ Submerged Macrophytes ____% ☐ Other ( ) ____%
GENERAL COMMENTS	

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMEN MAX SUBSAMPLE)	ANOMALIES* D	E	F	L	M	S	T	Z
Croaker	93									
Spadefish	26									
Panfish	7									
Least Puffer	3									
Gafftopsail Cat	2									
Gulf Toadfish	1									

C-11

2 of 2

FISH SAMPLING FIELD DATA SHEET (BACK)

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMEN MAX SUBSAMPLE)	ANOMALIES*							
			D	E	F	L	M	S	T	Z
[redacted]										
Bay Anchovy	x3									
[redacted]										
Speckled Trout	1	8"								
[redacted]										
Hardhead Cat	1									
[redacted]										
[redacted]										
[redacted]										
[redacted]										

*ANOMALY CODES: D = deformities; E = eroded fins; F = fungus; L = lesions; M = multiple DELT anomalies; S = emaciated; Z = other

FISH SAMPLING FIELD DATA SHEET (FRONT)

STREAM NAME Judet Cut	LOCATION C-12
STATION # _____ RIVERMILE _____	STREAM CLASS
LAT 29°19'28.92" LONG 90°23'37.41"	RIVER BASIN Terrebonne
STORET #	AGENCY
GEAR 16' otter Trawl 2-Gill Nets	INVESTIGATORS FLR RCA SR LF
FORM COMPLETED BY FLR	DATE 14-JUN-06 TIME 1000 (AM) PM / REASON FOR SURVEY

SAMPLE COLLECTION	How were the fish captured? ☐ back pack ☐ tote barge ☒ other Trawl GN Block nets used? ☐ YES ☒ NO Sampling Duration Start time 1022 / 1111 End time 1032 / 1121 Duration 10 min @ Stream width (in meters) Max 1152 Mean 1202 Nets - 2½ hrs
HABITAT TYPES	Indicate the percentage of each habitat type present ☐ Riffles ____% ☐ Pools ____% ☐ Runs ____% ☐ Snags ____% ☐ Submerged Macrophytes ____% ☐ Other ( ) ____%
GENERAL COMMENTS	

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMEN MAX SUBSAMPLE)	ANOMALIES* D	E	F	L	M	S	T	Z
Stingray	3									
Ladyfish	2									
Spadefish	10									
Lookdown	1									
Bay Whiff	4									

C-12

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FISH SAMPLING FIELD DATA SHEET (BACK)

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMEN MAX SUBSAMPLE)					ANOMALIES*							
							D	E	F	L	M	S	T	Z
Chain Pipefish	1													
Hardhead Catfish	16													
Least Puffer	4													
Gulf Toadfish	3													
Violet Goby	1													
Southern Flounder	1													

* ANOMALY CODES: D = deformities; E = eroded fins; F = fungus; L = lesions; M = multiple DELT anomalies; S = emaciated; Z = other

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FISH SAMPLING FIELD DATA SHEET (BACK)

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMEN MAX SUBSAMPLE)					ANOMALIES*							
							D	E	F	L	M	S	T	Z
[redacted]														
PM fish	12													
[redacted]														
Gulf Hogchoker Catfish	27													
[redacted]														
Croaker	19													
[redacted]														
Bay Anchovy	1022													
[redacted]														
Spotted Trout	1	7"												
[redacted]														
Black Neck Tonguefish	2													
[redacted]														

* ANOMALY CODES: D = deformities; E = eroded fins; F = fungus; L = lesions; M = multiple DELT anomalies; S = emaciated; Z = other

C-12 4-14

FISH SAMPLING FIELD DATA SHEET (BACK)

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMEN MAX SUBSAMPLE)	ANOMALIES*							
			D	E	F	L	M	S	T	Z
[redacted]										
Sheepshead	1									
[redacted]										
Gulf Menhaden	1									
[redacted]										
Spot	2									
[redacted]										
[redacted]										
[redacted]										
[redacted]										
[redacted]										

* ANOMALY CODES: D = deformities; E = eroded fins; F = fungus; L = lesions; M = multiple DELT anomalies; S = emaciated; Z = other

FISH SAMPLING FIELD DATA SHEET (FRONT)

page 1 of 3

STREAM NAME Bayou Platt	LOCATION C-13
STATION # _____ RIVERMILE _____	STREAM CLASS
LAT 29°14'469" LONG 90°46'38.8"	RIVER BASIN Terrebonne
STORET #	AGENCY
GEAR 16' Otter Trawl 2-Gill Nets	INVESTIGATORS FWS RCA SR
FORM COMPLETED BY FWS	DATE 9 Aug 06 TIME 1000 (AM) PM — REASON FOR SURVEY

SAMPLE COLLECTION	How were the fish captured? ☐ back pack ☐ tote barge ☒ other Gill Nets Trawl Block nets used? ☐ YES ☒ NO Sampling Duration Start time 1037 / 1115 / 1145 End time 1047 / 1125 / 1155 Duration 10 min @ Stream width (in meters) Max _____ Mean _____
HABITAT TYPES	Indicate the percentage of each habitat type present ☐ Riffles ____% ☐ Pools ____% ☐ Runs ____% ☐ Snags ____% ☐ Submerged Macrophytes ____% ☐ Other ( ) ____%
GENERAL COMMENTS	

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMEN MAX SUBSAMPLE)	ANOMALIES* D	E	F	L	M	S	T	Z
Pinfish	34									
Gafftopsail Cat	3									
Croaker	9									
Bay Anchovy	1063									
Spot	7									

C13 2013

FISH SAMPLING FIELD DATA SHEET (BACK)

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMEN MAX SUBSAMPLE)					ANOMALIES*							
							D	E	F	L	M	S	T	Z
Spadefish	6													
Gulf Toadfish	1													
Violet Goby	1													
Striped Blenny	1													
Sheepshead	2													
Silver Perch	3													

* ANOMALY CODES: D = deformities; E = eroded fins; F = fungus; L = lesions; M = multiple DELT anomalies; S = emaciated; Z = other

C-13

3-13

FISH SAMPLING FIELD DATA SHEET (BACK)

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMEN MAX SUBSAMPLE)					ANOMALIES*							
							D	E	F	L	M	S	T	Z
[redacted]														
Sand Sea trout	1	6"												
[redacted]														
Bull Shark	4													
[redacted]														
Hardhead Catf	3													
[redacted]														
Spa. Bl. Mackerel	1	1.6"												
[redacted]														
Speckled Trout	1	5.5"												
[redacted]														
Unknown Seatrout	17	2"	1.3"	1.3"	1.25"	1.25"								
[redacted]		1.1"	1.3"	1.1"	1.2"	1.4"								
		1.5"	1.5"	1.6"	2"	1.4"								
		1.2"	3"											

* ANOMALY CODES: D = deformities; E = eroded fins; F = fungus; L = lesions; M = multiple DELT anomalies; S = emaciated; Z = other

FISH SAMPLING FIELD DATA SHEET (FRONT)

STREAM NAME Fred Bayou	LOCATION C-14
STATION # _____ RIVERMILE _____	STREAM CLASS
LAT 29°18'32.0" LONG 90°54'34.9"	RIVER BASIN Terrebonne
STORET #	AGENCY
GEAR 16'0 Otter Trawl 2-6.11 Nets	INVESTIGATORS FET RCA SR
FORM COMPLETED BY FET	DATE 8A+06 TIME 1330 AM (PM) / REASON FOR SURVEY

SAMPLE COLLECTION	How were the fish captured? ☐ back pack ☐ tote barge ☒ other Trawl Gill Net Block nets used? ☐ YES ☒ NO Sampling Duration Start time 1350 / 1420 End time 1400 / 1430 Duration 10 min (2) Stream width (in meters) Max 1452 Mean 1502
HABITAT TYPES	Indicate the percentage of each habitat type present ☐ Riffles ____% ☐ Pools ____% ☐ Runs ____% ☐ Snags ____% ☐ Submerged Macrophytes ____% ☐ Other ( ) ____%
GENERAL COMMENTS	

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMEN MAX SUBSAMPLE)					ANOMALIES*							
							D	E	F	L	M	S	T	Z
Bull Shark	2	35"	35"											
Red Drum	1	11.5"												
Blackl Drum	1	21"												
Least Puffer	11													
Silver Perch	1													
Unknown Sutrat	2	1.1"	1.2"											

C-14

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FISH SAMPLING FIELD DATA SHEET (BACK)

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMEN MAX SUBSAMPLE)					ANOMALIES*							
							D	E	F	L	M	S	T	Z
[redacted]														
Bay Anchovy	758													
[redacted]														
Sand Seatrout	6	4"	3"	3"	2"									
[redacted]														
Violet Goby	1													
[redacted]														
Croaker	25													
[redacted]														
Gafftopsail Cat	16													
[redacted]														
Stingray	1													
[redacted]														

* ANOMALY CODES: D = deformities; E = eroded fins; F = fungus; L = lesions; M = multiple DELT anomalies; S = emaciated; Z = other

FISH SAMPLING FIELD DATA SHEET (FRONT)

STREAM NAME Bayou DeLarge	LOCATION C-15
STATION # _____ RIVERMILE _____	STREAM CLASS
LAT 29°16'57.1" LONG 90°52'54.3"	RIVER BASIN Terrebonne
STORET #	AGENCY
GEAR 16' Otter Trawl 2-Gill Nets	INVESTIGATORS FCJ RCA SR
FORM COMPLETED BY FCJ	DATE 8 Aug 06 TIME 1000 AM (PM) / REASON FOR SURVEY

SAMPLE COLLECTION	How were the fish captured? ☐ back pack ☐ tote barge ☒ other Trawl Gill Net Block nets used? ☐ YES ☒ NO Sampling Duration Start time 1015 / 1044 End time 1025 / 1051 Duration 10 min @ Stream width (in meters) Max 1113 Mean 1123
HABITAT TYPES	Indicate the percentage of each habitat type present ☐ Riffles ____% ☐ Pools ____% ☐ Runs ____% ☐ Snags ____% ☐ Submerged Macrophytes ____% ☐ Other ( ) ____%
GENERAL COMMENTS	

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMEN MAX SUBSAMPLE)	ANOMALIES* D	E	F	L	M	S	T	Z
Croaker	12									
Pinfish	4									
Spot	2									
Sheepshead	2									
Spot Black Tail	1	6.5"								

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FISH SAMPLING FIELD DATA SHEET (BACK)

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMEN MAX SUBSAMPLE)	ANOMALIES*							
			D	E	F	L	M	S	T	Z
Spadefish	6									
Bay Anchovy	54									
Least Puffer	2									
Gulf Toadfish	2									
Gafftopsail Cat	5									
Hardhead Cat	14									

*ANOMALY CODES: D = deformities; E = eroded fins; F = fungus; L = lesions; M = multiple DELT anomalies; S = emaciated; Z = other

APPENDIX B

Field Survey Forms & Field Data Sheets

Field Survey Form

Site #: C-11 **Subsegment:** _____ **Date:** 7 Aug 06 **Time:** 1530

Waterbody: Bayou Tambour
Site Location: 29° 21' 36.94" 90° 31' 33.03"
Personnel: Rod Schultz, Ray Albert, Sarah Ray, Lane Foster

Type of work: ☐ Recon ☒ Stream Characterization Survey ☐ Other

Weather Conditions:
- ☐ Few Clouds
- ☒ Partly Cloudy
- ☐ Cloudy/Overcast
- ☐ Fog/Smoke
- ☐ Drizzle/Light Rain
- ☐ Showers
- ☐ Snow

Temperature:
- ☒ Hot >85 °F
- ☐ Warm > 75 °F
- ☐ Mild > 65 °F
- ☐ Cool > 60 °F
- ☐ Cold < 60 °F

Stream Characteristics:
Natural: ☒ Yes ☐ No Dredged: ☐ Yes ☐ No Stream Man-Made: ☐ Yes ☐ No
Water Depth:
Water Temperature:
Width:

In-situ Water Quality Measurements: ☐ Yes ☐ No **Profiling:** ☐ Yes ☐ No
Continuous Monitor Deployed: ☐ Yes ☐ No Probe S/N: _____
Continuous Monitor Retrieved: ☐ Yes ☐ No Probe S/N: _____
Type/Model of Unit used: _____
Water Quality Samples Taken: ☐ Yes ☒ No
Flow Characteristics:
Flowing: ☐ Yes ☐ No Measurable Flow: ☐ Yes ☐ No
Flow Direction: ☐ Upstream ☐ Downstream Tidally Influenced: ☐ Yes ☐ No
Wind Influence: ☐ Yes ☐ No
Flow Measurement: ☐ Yes ☒ No Measurement Location: _____
Type of Measurement: ☐ Wading ☐ Bridge Board ☐ Boat Board
Flow Estimated: ☐ Yes ☒ No Measurement Location: _____
Using Discharge Equipment: ☐ Yes ☐ No
Cross Section Measurement: ☐ Yes ☒ No Measurement Location: _____
Type of Measurement: ☐ Manual ☐ Fathometer
GPS Measurement: ☐ Yes ☐ No GPS SSF File Name: _____
Photos Taken: ☐ Yes ☒ No
Light Penetration:
Comments:

Field Survey Form

Site #: C-12 **Subsegment:** _____ **Date:** 7/14/06 **Time:** 1000

Waterbody: Judes Cut
Site Location: 29° 19' 28.21" 90° 23' 37.40"
Personnel: Fred Schulte, Ray Albert, Sarah Roy, Lance Fontenot

Type of work: ☐ Recon ☒ Stream Characterization Survey ☐ Other

Weather Conditions:
- ☐ Few Clouds
- ☒ Partly Cloudy
- ☐ Cloudy/Overcast
- ☐ Fog/Smoke
- ☐ Drizzle/Light Rain
- ☐ Showers
- ☐ Snow

Temperature:
- ☒ Hot >85 °F
- ☐ Warm > 75 °F
- ☐ Mild > 65 °F
- ☐ Cool > 60 °F
- ☐ Cold < 60 °F

Stream Characteristics:
Natural: ☒ Yes ☐ No Dredged: ☐ Yes ☐ No Stream Man-Made: ☐ Yes ☐ No
Water Depth:
Water Temperature:
Width:

In-situ Water Quality Measurements: ☐ Yes ☐ No **Profiling:** ☐ Yes ☐ No
Continuous Monitor Deployed: ☐ Yes ☐ No Probe S/N: _____
Continuous Monitor Retrieved: ☐ Yes ☐ No Probe S/N: _____
Type/Model of Unit used: _____
Water Quality Samples Taken: ☐ Yes ☒ No
Flow Characteristics:
Flowing: ☐ Yes ☐ No Measurable Flow: ☐ Yes ☐ No
Flow Direction: ☐ Upstream ☐ Downstream Tidally Influenced: ☐ Yes ☐ No
Wind Influence: ☐ Yes ☐ No
Flow Measurement: ☐ Yes ☒ No Measurement Location: _____
Type of Measurement: ☐ Wading ☐ Bridge Board ☐ Boat Board
Flow Estimated: ☐ Yes ☒ No Measurement Location: _____
Using Discharge Equipment: ☐ Yes ☒ No
Cross Section Measurement: ☐ Yes ☐ No Measurement Location: _____
Type of Measurement: ☐ Manual ☐ Fathometer
GPS Measurement: ☐ Yes ☐ No GPS SSF File Name: _____
Photos Taken: ☐ Yes ☐ No
Light Penetration:
Comments:

Field Survey Form

Site #: C-13 **Subsegment:** _____ **Date:** 9 Aug 06 **Time:** 1000

Waterbody: Bayou Platt
Site Location: 29° 14' 46.93" 90° 46' 38.87"
Personnel: Fred Schultz, Ray Albert, Sarah Roy

Type of work: ☐ Recon ☒ Stream Characterization Survey ☐ Other

Weather Conditions:
- ☐ Few Clouds
- ☒ Partly Cloudy
- ☐ Cloudy/Overcast
- ☐ Fog/Smoke
- ☐ Drizzle/Light Rain
- ☐ Showers
- ☐ Snow

Temperature:
- ☒ Hot >85 °F
- ☐ Warm > 75 °F
- ☐ Mild > 65 °F
- ☐ Cool > 60 °F
- ☐ Cold < 60 °F

Stream Characteristics:
Natural: ☒ Yes ☐ No Dredged: ☐ Yes ☐ No Stream Man-Made: ☐ Yes ☐ No
Water Depth:
Water Temperature:
Width:

In-situ Water Quality Measurements: ☐ Yes ☒ No **Profiling:** ☐ Yes ☐ No
Continuous Monitor Deployed: ☐ Yes ☐ No Probe S/N: _____
Continuous Monitor Retrieved: ☐ Yes ☐ No Probe S/N: _____
Type/Model of Unit used: _____

Water Quality Samples Taken: ☐ Yes ☒ No

Flow Characteristics:
Flowing: ☐ Yes ☐ No Measurable Flow: ☐ Yes ☐ No
Flow Direction: ☐ Upstream ☐ Downstream Tidally Influenced: ☐ Yes ☐ No
Wind Influence: ☐ Yes ☐ No

Flow Measurement: ☐ Yes ☒ No Measurement Location: _____
Type of Measurement: ☐ Wading ☐ Bridge Board ☐ Boat Board

Flow Estimated: ☐ Yes ☒ No Measurement Location: _____
Using Discharge Equipment: ☐ Yes ☐ No

Cross Section Measurement: ☐ Yes ☒ No Measurement Location: _____
Type of Measurement: ☐ Manual ☐ Fathometer

GPS Measurement: ☐ Yes ☐ No GPS SSF File Name: _____

Photos Taken: ☐ Yes ☒ No

Light Penetration:

Comments:

Field Survey Form

Site #: C-14 **Subsegment:** _____ **Date:** 8 Aug 06 **Time:** 1300

Waterbody: Fred Bayou
Site Location: 29° 18' 32.04" 90° 54' 34.98"
Personnel: Fred Schultz, Ray Albert, Sarah Ray

Type of work: ☐ Recon ☒ Stream Characterization Survey ☐ Other

Weather Conditions:
- ☐ Few Clouds
- ☒ Partly Cloudy
- ☐ Cloudy/Overcast
- ☐ Fog/Smoke
- ☐ Drizzle/Light Rain
- ☐ Showers
- ☐ Snow

Temperature:
- ☒ Hot >85 °F
- ☐ Warm > 75 °F
- ☐ Mild > 65 °F
- ☐ Cool > 60 °F
- ☐ Cold < 60 °F

Stream Characteristics:
Natural: ☒ Yes ☐ No Dredged: ☐ Yes ☐ No Stream Man-Made: ☐ Yes ☐ No
Water Depth:
Water Temperature:
Width:

In-situ Water Quality Measurements: ☐ Yes ☒ No **Profiling:** ☐ Yes ☐ No
Continuous Monitor Deployed: ☐ Yes ☐ No Probe S/N: _____
Continuous Monitor Retrieved: ☐ Yes ☐ No Probe S/N: _____
Type/Model of Unit used: _____

Water Quality Samples Taken: ☐ Yes ☒ No

Flow Characteristics:
Flowing: ☐ Yes ☐ No Measurable Flow: ☐ Yes ☐ No
Flow Direction: ☐ Upstream ☐ Downstream Tidally Influenced: ☐ Yes ☐ No
Wind Influence: ☐ Yes ☐ No

Flow Measurement: ☐ Yes ☒ No Measurement Location: _____
Type of Measurement: ☐ Wading ☐ Bridge Board ☐ Boat Board

Flow Estimated: ☐ Yes ☒ No Measurement Location: _____
Using Discharge Equipment: ☐ Yes ☐ No

Cross Section Measurement: ☐ Yes ☒ No Measurement Location: _____
Type of Measurement: ☐ Manual ☐ Fathometer

GPS Measurement: ☐ Yes ☐ No GPS SSF File Name: _____

Photos Taken: ☐ Yes ☒ No

Light Penetration:

Comments:

Field Survey Form

Site #: C-15 **Subsegment:** _____ **Date:** 8 Aug 06 **Time:** 1000

Waterbody: off Bayou Dularge
Site Location: 29° 16' 57.12" 90° 52' 54.36"
Personnel: Fred Schultz, Ray Albert, Sarah Roy

Type of work: ☐ Recon ☒ Stream Characterization Survey ☐ Other

Weather Conditions:
- ☐ Few Clouds
- ☒ Partly Cloudy
- ☐ Cloudy/Overcast
- ☐ Fog/Smoke
- ☐ Drizzle/Light Rain
- ☐ Showers
- ☐ Snow

Temperature:
- ☒ Hot >85 °F
- ☐ Warm > 75 °F
- ☐ Mild > 65 °F
- ☐ Cool > 60 °F
- ☐ Cold < 60 °F

Stream Characteristics:
Natural: ☒ Yes ☐ No Dredged: ☐ Yes ☐ No Stream Man-Made: ☐ Yes ☐ No
Water Depth:
Water Temperature:
Width:

In-situ Water Quality Measurements: ☐ Yes ☒ No **Profiling:** ☐ Yes ☐ No
Continuous Monitor Deployed: ☐ Yes ☐ No Probe S/N: _____
Continuous Monitor Retrieved: ☐ Yes ☐ No Probe S/N: _____
Type/Model of Unit used: _____

Water Quality Samples Taken: ☐ Yes ☒ No

Flow Characteristics:
Flowing: ☐ Yes ☐ No Measurable Flow: ☐ Yes ☐ No
Flow Direction: ☐ Upstream ☐ Downstream Tidally Influenced: ☐ Yes ☐ No
Wind Influence: ☐ Yes ☐ No

Flow Measurement: ☐ Yes ☒ No Measurement Location: _____
Type of Measurement: ☐ Wading ☐ Bridge Board ☐ Boat Board

Flow Estimated: ☐ Yes ☒ No Measurement Location: _____
Using Discharge Equipment: ☐ Yes ☐ No

Cross Section Measurement: ☐ Yes ☒ No Measurement Location: _____
Type of Measurement: ☐ Manual ☐ Fathometer

GPS Measurement: ☐ Yes ☐ No GPS SSF File Name: _____

Photos Taken: ☐ Yes ☒ No

Light Penetration:

Comments:

Field Data Sheet - Water Sampling Logs

Station/ Depth	Measurement			Gage Reading	Temp. °C	DO mg/L	Sp. Cond. ~~µS~~ mS	pH s.u.	Turbidity NTU	Salinity ppt	No. of Containers	Notes (Attach additional sheet or reference page in field notebook, if necessary)
	Date	Time	Who									
C-11	7 Aug 06	1530 hrs	SR FES RCA LF		31.3	7.05	35.67	8.1		20.1		GPS: Weather/Stream conditions: Secchi- 12" Problems/corrective action:
C-12	7 Aug 06	1000 hrs	SR FES RCA LF		30.1	4.74	41.50	7.93		23.9		GPS: Weather/Stream conditions: Secchi- 12" Problems/corrective action:
C-13	9 Aug 06	1000 hrs	SR FES RCA		31.0	5.27	24.169	8.01		13.2		GPS: Weather/Stream conditions: Secchi- 14" Problems/corrective action:
C-14	8 Aug 06	1330 hrs	SR FES RCA		32.4	6.77	19.58	7.97		10.0		GPS: Weather/Stream conditions: Secchi- 16" Problems/corrective action:
C-15	8 Aug 06	1000 hrs	SR FES RCA		30.0	4.9	30.63	7.9		17.1		GPS: Weather/Stream conditions: Secchi- 16" Problems/corrective action:

APPENDIX C

Qualifications of Personnel

CURRICULUM VITAE
FREDERICK EDWARD SCHULTZ

FRED E. SCHULTZ received his B.S. in Zoology (1977) from Western Illinois University and his M.S. in Marine Biology (1981) from the University of Mississippi.

His duties include reviewing environmental data and developing plans to monitor or assess potential environmental problems. He coordinates with other employees to ensure that the plans are implemented, reviews the results and prepares reports assessing the data and recommending appropriate actions. He is also responsible to collect, interpret and report findings from waste disposal facilities to shelter clients from potential environmental liability.

GENERAL EXPERIENCE

BIOLOGIST – E & E Group, LLC – Kenner, Louisiana (June 2001 to Present)

- Coordinate and implement endangered species survey on waterway in Baton Rouge for U.S. Army Corps of Engineers.
- Determine water quality monitoring and effects of dredging in an oyster leased area.
- Coordinate and assist wetland determinations, develop 404 permit applications and handle mitigation options.
- Coordinate the collection of oyster samples in conjunction with the discharge of freshwater onto oyster lease areas for the State of Louisiana.
- Write proposals; analyze and write reports on field data.
- Coordinate, perform and interpret information pertaining to Phase I and Phase II environmental assessments.

BIOLOGIST – STEIMLE & ASSOCIATES, INC. – Metairie, Louisiana (May 1981 to May 2001)

- Coordinate field personnel to conduct creel surveys along Louisiana and Texas coasts for government project. Review, interpret and prepare report of findings for publication and distribution.
- Implement oil spill and water quality monitoring programs of oyster leased areas near Pelican Island, Turtle Bay, Breton Sound, Bayou Goreau, Grand Bayou, and Wilkinson Bayou in Louisiana.
- Coordinate the collection of fish and shellfish samples near produced water discharges for government project. Collect, identify and prepare specimens for analysis.

GENERAL EXPERIENCE (continued)

- Conduct field studies and coordinate remediation of 3 acre facility contaminated with diesel oil. Collect samples, review data and prepare report of findings.
- Identification of fish and shellfish from study areas in and around Lake Pontchartrain and determine any correlations with water quality parameters.
- Develop methods to sample adult and larval fish from a water body adjoining a coal fired power plant.
- Determine water quality monitoring and effects of dredging in an oyster leased area.
- Assemble and interpret fisheries data for environmental impact study for determining the effect of shell dredging in Lake Pontchartrain.
- Coordinate field inspections, sampling, and report writing for drilling mud effects in the aquatic environment around inshore drilling platforms.
- Determine the effects of drilling mud in crawfish ponds associated with an accidental spill.
- Develop, manage and analyze a creel survey along Mississippi, Louisiana and Texas coasts relating to recreational and commercial fishermen fishing habits near oilfield structures and produced water discharge locations.
- Coordinate, perform and interpret information pertaining to underground storage tank environmental assessments.
- Studied Foramifera stratification in conjunction with spoil deposition on oyster leases.
- Develop and implement an environmental audit system for offshore and inshore oilfield production facilities.
- Investigate effects of produced water discharge on adjacent forested property.
- Collect and identify organisms in trawl samples from Lake Pontchartrain. Analyze data and prepare report for publication and distribution.
- Collect soil samples and develop and implement remediation plan for property associated with oilfield activities.
- Conduct environmental assessment surveys for large oilfield site. Collect soil and water samples, analyze data and prepare reports of findings.
- Devise system to review and evaluate waste treatment/ disposal facilities for compliance with Federal, State and local regulations and sound environmental practice.

GENERAL EXPERIENCE (continued)

- Write Environmental Reports for oil companies using the Gulf of Mexico for oil and gas exploration.
- Coordinate inspections, data collection and report writing of waste disposal/treatment facilities utilizing processes for handling hazardous and non-hazardous oilfield wastes.
- Involved in clean-up procedures of an oilfield waste pit.
- Coordinate field inspections, data collection and report writing of a hazardous waste pit clean-up.
- Write proposals; analyze and write reports on field data.
- Coordinate, perform and interpret information pertaining to Phase I and Phase II environmental assessments.

GRADUATE STUDENT/RESEARCH ASSISTANT - FISHERY SECTION GULF COAST RESEARCH LAB - Ocean Springs, MS (January 1979 to May 1981)

- ❖ Identify larval, juvenile, and adult fishes from Bluff Creek, West Pascagoula River in conjunction with research projects.
- ❖ Identify larval, juvenile, and adult fishes from the Gulf of Mexico in conjunction with research projects performed off the coasts of Mississippi, Louisiana, Alabama and Texas.
- ❖ Responsible for the curation of Gulf Coast Research Laboratory Gulf of Mexico larval fish collection.
- ❖ Coordinate adult fish and ichthyoplankton sampling.
- ❖ Complete larval fish illustrations.
- ❖ Coordinate collection and culture of freshwater percichthyid fishes.
- ❖ Design, set up and operate a system to propagate fish from the Family Percichthyidae.

RESEARCH ASSISTANT, BIOLOGY DEPARTMENT UNIVERSITY OF ALABAMA - Birmingham, AL (July 1980 to September 1980)

- ❖ Collection of blood and gonad samples of fishes from the Families Scombridae and Istiophoridae.
- ❖ Data collection associated with the blood and gonad samples.
- ❖ Coordinate with charter boat captains to obtain data for study.

GENERAL EXPERIENCE (continued)

GRADUATE STUDENT/TEACHING ASSISTANT, BIOLOGY DEPARTMENT - University of Mississippi, University, MS (January 1978 to December 1978)

- ❖ Identify Gulf of Mexico fishes for University of Mississippi fish collection.
- ❖ Collection, identification, and analysis of data on field collected mosquitoes (Culicidae).
- ❖ Prepared experimental materials and oral presentations for general biology and comparative anatomy classes.

TECHNICIAN - NORTHWEST MOSQUITO ABATEMENT DISTRICT - Wheeling, IL (May 1976 to July 1978-Summers)

- ❖ Collection, identification, and analysis of field collected mosquitoes (Culicidae).
- ❖ Assist in the raising of fish from the Family Poeciliidae for the stocking of ponds and small lakes.

SPECIAL SKILLS AND EQUIPMENT EXPERIENCE

- Biological illustration; drafting; fish preservation; laboratory rearing of larval fishes; collection of adult and larval fish; clearing and staining of larval fish.
- Experience using or operating: outboard motorboats; plankton nets; trammel nets; midwater trawls; seines; cast nets; light traps; salinometers; DO meters; core samples; benthic grabs; small hand dredges; atomic absorption spectrophotometer; spectrophotometers; large scale aquarium systems; word processors.

OTHER EXPERIENCE

- ➢ Organizer of a workshop for Sixth Annual Larval Fish Conference, Solomons, MD 1982 (Identification of larval Morone specimens).
- ➢ Reviewed the Manuscript for the Percichthyidae chapter of the larval fish identification manual: Larval Fishes of the Great Lakes Region 1981.
- ➢ Scientist for NOAA, NMFS vessel R/V Oregon II during 1978 groundfish survey off Mississippi and Louisiana.

PUBLICATIONS

1. Olney, J.E., G. Grant, F.E. Schultz, C.L. Cooper, and J. Hageman. 1983. Pterygiophore-interdigitation patterns in larvae of four Morone species. Trans. Am. Fish. Soc., 112:525-53l.

2. Schultz, F.E. Reproduction and early life history of Morone mississippiensis (Percicht-hyidae) with comparisons with three other Morone species. (in preparation)

3. Schultz, F.E. Larval comparisons of three species of Morone (Percichthyidae) Poster session. Sixth Annual Larval Fish Conference. Solomons, M.D. 1982.

4. Steingraber, W.A., F.E. Schultz and S.E. Steimle. 1990. Mobil Waste Management certification system. IN: Proceedings of the First International Symposium on Oil and Gas Exploration and Production Wastes Management Practices, New Orleans, Louisiana, pp. 599-610.

PROFESSIONAL SOCIETIES

- ◊ American Fisheries Society - Early Life History Section
- ◊ Water Environment Federation
- ◊ National Groundwater Association

SEMINARS & COURSES

- ✓ Louisiana Department of Environmental Quality Certified Asbestos Inspector
- ✓ Hazardous Waste Site Health & Safety Training
- ✓ Groundwater and Vadose Zone Monitoring and Sampling Technology

CURRICULUM VITAE
MICHAEL F. RAYLE

Michael F. Rayle received his B.A. in Biological Sciences (1974) from the University of New Orleans and his M.S. (1978) in Biological Sciences from the University of New Orleans. He has completed 24 additional hours of post graduate course work at Tulane University.

AREAS OF PROFESSIONAL INTEREST

- Pollution Ecology of Estuarine and Marine Invertebrates.
- Computer Applications of Statistics to Ecological and Taxonomic Problems.
- Ecology and Systematics of Estuarine Invertebrates.
- Estuarine Water Quality.

LIST OF RELEVANT GRADUATE AND UNDERGRADUATE COURSES

- Ecology
- Aquatic Pollution and Toxicology
- Invertebrate Zoology
- Ecology and Systematics of Estuarine Invertebrates
- Limnology and Oceanography
- Fisheries Biology
- Malacology
- Physiological Ecology
- Biostatistics
- Vertebrate Zoology

LIST OF RELEVANT GRADUATE AND UNDERGRADUATE COURSES (continued)

- Quantitative Analysis
- Computer Science
- Computers in Scientific Research

PROFESSIONAL EXPERIENCE

1. University of New Orleans - Louisiana
   Water Research Institute Project -
   Student Worker - 1974-75

2. University of New Orleans -
   Introductory Biology Labs and Senior Level Limnology and Oceanography Lab -
   Teaching Assistant - 1975-77

3. University of New Orleans - Lake Pontchartrain Water
   Quality Project -
   Research Assistant - 1975-77

4. University of New Orleans - Graduate Research on the Effects of Pollution on Lake Pontchartrain Estuarine Invertebrates -
   Graduate Student - 1975-77

5. Steimle & Associates, Inc. 1977 – June, 2001

   A. Numerous Oyster Resource Surveys required by the Louisiana Department of Wildlife & Fisheries for Louisiana Department of Natural Resources - Coastal Management Division Coastal Use Permits.

   B. Surveys of actual and potential damage to oyster reef communities from various types of hydrocarbon pollution (oil, drilling mud, chemical spills) and physical destruction (grounding, dredging, seismic surveys) involving several thousand acres and hundreds of oyster leases across southeast Louisiana. This work has been performed for both plaintiffs and defendants on different occasions.

   C. Ground truthing of side scan sonar data collected for Louisiana Department of Natural Resources Davis Pond Freshwater Diversion Oyster Lease Relocation Project.

PROFESSIONAL EXPERIENCE (continued)

D. Monitoring of 1997 Bonnet Carre' Spillway Opening for USACOE-NOD to determine the impacts on oyster resources in Lake Borne and Mississippi Sound.

E. Wetland ecological evaluations associated with Corps of Engineers Sections 10 and 404 dredge and fill permits and Louisiana DNR Coastal Use Permits.

F. Conducted several studies of the impacts of produced water discharges on fresh, brackish and saline marsh habitats across coastal Louisiana.

G. The evaluation of potential impacts associated with the siting and permitting of several solid waste landfills and a transfer station in the New Orleans metropolitan area and surrounding parishes.

H. The preparation of Environmental Impact Statements and Assessments for various projects in Louisiana's wetlands.

I. Water Quality and Biological Monitoring in and adjacent to North Shore, Lake Pontchartrain.

J. Development of technically based local pretreatment limits and industrial pretreatment program for the City of Kenner.

THESIS

Zonation of Lake Pontchartrain Invertebrates in a Polluted New Orleans Outfall Canal (Masters Thesis - 1978).

CONFERENCE PRESENTATIONS

1. Zonation of Lake Pontchartrain Invertebrates in a Polluted New Orleans Outfall Canal. Louisiana Water Pollution Control Association - 1978 Annual Meeting, Baton Rouge, Louisiana.

2. Distribution of Lake Pontchartrain Invertebrates in a Polluted New Orleans Outfall Canal. Estuarine Research Federation Biennial International Conference 1979, Jekyll Island, Georgia.

CONFERENCE PRESENTATIONS (continued)

3. Produced Water Impacts on Louisiana Wetlands.
   International Produced Water Symposium; - 1992 San Diego, California.

4. Produced Water Radionuclides Fate and Effects.
   International Produced Water Symposium - 1992, San Diego, California.

PUBLICATIONS

1. Steimle & Associates, Inc. 1991. Produced Water Impacts on Louisiana Wetlands. Publ. No. 4517. Health and Environmental Sciences Dept., American Petroleum Institute, Washington, D.C. 132 pp.

2. M. F. Rayle and M. M. Mulino. 1992. Produced Water Impacts in Louisiana Coastal Waters. pp. 343-354. In: J. P. Ray and F. R. Englehardt (Eds.) Produced Water: Technological/Environmental Issues and Solutions. Proceedings of the 1992 International Produced Water Symposium, February 4-7, 1992. Plenum Press. New York. 616 pp.

3. M. M. Mulino and M. F. Rayle. 1992. Produced Water Radionuclides Fate and Effects. pp. 281-292. In: J. P. Ray and F. R. Englehardt (Eds.) Produced Water: Technological/Environmental Issues and Solutions. Proceedings of the 1992 International Produced Water Symposium, February 4-7, 1992. Plenum Press. New York. 616 pp.

4. Mulino, M.M., M.F. Rayle, J.C. Francis and M.A. Poirrier. 1996. Delineation of Benthic Impact and Recovery at Two Produced Water Discharge Sites in Inshore Louisiana. In Produced Water 2: Proceedings of the 2nd International Symposium on Produced Water in Trondheim, Norway. September, 1995. p. 177-194.

5. G.E.C., Inc. and Steimle & Associates, Inc., 1998. Results of Oyster Sampling in Mississippi Sound and Lake Borgne During and After the 1997 Bonnet Carre' Spillway Opening. p. 2-1 to 2-44. In: Biological and Recreational Monitoring of the Impacts of the 1997 Bonnet Carre' Spillway Southeastern Louisiana. Final Report Contract DACW29-96-D-0009, U.S. Army Corps of Engineers, New Orleans, Louisiana.

PROFESSIONAL SOCIETIES

- Louisiana Water Environment Association
- Water Environment Federation
- Beta Beta Beta Biological Honor Society
- Gulf Estuarine Research Society
- Estuarine Research Federation
- Louisiana Environmental Professionals Association
- National Shellfisheries Association

COURT APPEARANCES

Has been qualified in Federal and Louisiana State Courts as an expert in aquatic biology and oyster biology.

CERTIFICATIONS

LDNR Oyster Damage Evaluation Board - Certified Biologist.

Hazardous Waste Operations & Emergency Response (Hazwoper) In Accordance with OSHA 29 CFR 1910.120.

CURRICULUM VITAE
RAYMOND CHRISTOPHER ALBERT

Raymond C. Albert completed the Drafting and Design Program at E.P. Nunez Community College and attended Southeastern Louisiana University. In 1999, he completed the Environmental Site Assessments course at Louisiana State University Division of Continuing Education. In 2001, he completed a Wetland Delineation course based on the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual.

ENVIRONMENTAL FIELD EXPERIENCE

Experienced in Phase I Assessments, oil spill assessment, monitoring & sampling, NORM surveys, groundwater monitoring well sampling, water quality measurements and sampling, LDNR oyster resource surveys, creel sampling and collection using gillnets, trawls, cast nets & seines, creel surveys, crustacean collection, and benthos collection.

GENERAL EXPERIENCE

- Supervisor of Design & Drafting Department – E & E Group, LLC
  Chief Field Technician Kenner, Louisiana
  June 2001 to Present

  Duties include preparation and delivery of all drawings and maps for projects. Using ACAD and incorporating sidescan sonar imagery and digital ortho quadrangle imagery in real world coordinate systems. Also responsible for upkeep and maintenance of all equipment used for field sampling and monitoring.

- Environmental Specialist - Steimle & Associates, Inc., Engineers & Ecologists
  Metairie, Louisiana
  July 1992 to May 2001

  Environmental Specialist, with field and office responsibilities. These include preparing CADD drawings for various projects including landfills, site plans, sub surface cross sections, building layouts, topographic and dredging/pipeline installation drawings. Field responsibilities include professional support for underground storage tank investigations, oyster resource surveys, oil spill sampling, oil rig move monitoring, water sampling, sediment sampling, groundwater monitoring well sampling, Phase I and II Environmental audits, wetland delineations, organism collection and soil core collection.

GENERAL EXPERIENCE (continued)

He is also experienced in the operation of various workboats, DGPS navigation systems, fathometer, current meters, Eckman dredge, Van Dorn bottle, oyster dredge, salinometer, dissolved oxygen meter, pH meter, drilling equipment, bottom sediment corer, hand auger, power auger, Ludlum 12S gamma survey meter, organic vapor analyzer, and Hazwopper certified, with current 8 hour refresher.

- Draftsman - Linfield, Hunter & Junius, Inc., Engineers & Architects
  New Orleans, Louisiana
  October 1989 to June 1992

  As draftsman and CADD operator, he was responsible for preparing construction drawings such as civil site work, steel framing, reinforced concrete, site layouts and street work. Assisted the engineers with surveying and field measurements.

- Warehouse Supervisor - Baxter Hospital Supply
  Destrehan, Louisiana
  October 1988 to April 1989

  Responsible for managing the shipping department, maintaining daily paperwork, submitting monthly reports, supervising employees and maintaining accurate shipping records.

- Warehouse Supervisor - Owens & Minor, Inc.
  Harahan, Louisiana
  September 1986 to October 1988

  Responsible for managing the shipping department, maintaining daily paperwork, submitting monthly reports, supervising employees and maintaining accurate shipping records.